Personal Computing Acceptance Factors in Small Firms: A Structural Equation Model[1]

By: Magid Igbaria
Programs in Information Science
The Claremont Graduate University
130 East Ninth Street
Claremont, CA 91711
U.S.A.
igbariam@cgs.edu

and

Tel Aviv University

Nancy Zinatelli
Ernst & Young
Pacific Center
P.O. Box 10101
1510–700 West Georgia Street
Vancouver, BC V7Y 1C7
CANADA
nancy.bennison@ca.eyi.com

Paul Cragg
Department of Accountancy, Finance & Information Systems
University of Canterbury
Private Bag 4800
Christchurch 8001
NEW ZEALAND
p.cragg@afis.canterbury.ac.nz

Angele L.M. Cavaye
School of Systems Engineering, Policy Analysis and Management
Delft University of Technology
P.O. Box 5015
THE NETHERLANDS
angelec@sepa.tudelft.nl

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Abstract

This study draws upon the technology acceptance model as the theoretical basis and empirical findings for a pragmatic explanation of key factors affecting personal computing acceptance in small firms. The study uses results from a survey of 358 users in small firms in New Zealand to test a structural model examining the hypothesized relationships among the following constructs: intraorganizational factors, extraorganizational factors, perceived ease of use, perceived usefulness, and personal computing acceptance (i.e., system usage). The findings indicate that perceived ease of use is a dominant factor in explaining perceived usefulness and system usage, and that perceived usefulness has a strong effect on system usage. The results also indicate that exogenous variables influence both perceived ease of use and perceived usefulness, particularly management support and external support. Inconsistent with prior research in large firms, relatively little support was found for the influence of both internal support and internal training. Implications for the acceptance of personal computing and future research on personal computing acceptance in small firms are discussed.

Keywords: Personal computing acceptance, small firms, intraorganizational factors, extraorganizational factors, technology acceptance model

ISRL Categories: AA, DA0201, EL03, FD, GA03, GB, GC

Introduction

The increasing importance and proliferation of microcomputers and end-user computing (EUC) represents a significant development in the information systems (IS) field (Davis et al. 1989; DeLone 1988; Igbaria 1993; Rivard and Huff 1988). This proliferation has helped make personal computing a significant activity in

small firms (Raymond and Bergeron 1992). In 1985, 25% of small firms were using computers; by 1990, 67.5% of small firms were using computers (*BusinessWeek* 1994).

Compared with larger firms, small firms usually cannot afford to employ internal staff with specialized computer expertise (Nooteboom 1988). This means that small firms face substantial risks and problems with their computerization: they have a general lack of computer knowledge, have inadequate hardware and software, need to rely on outside resources, experience a lack of financial resources and technical support, have recruitment difficulties, and have a short-range management perspective imposed by a volatile competitive environment (Soh et al. 1992).

Thus, despite the proliferation of microcomputers, various problems within small firms have limited the potential benefits of microcomputers. The actual use of microcomputers by professionals and managers in small firms appears to be limited to mainly accounting applications (Cragg and King 1993). It is suggested that small firms can increase the benefits from computing and can enhance the usage of computers by increasing the number and type of applications available to them.

Much IS implementation research has focused on large organizations and has identified several factors affecting IS success. However, previous research suggests that there is a relationship between organizational size and computer success characteristics (DeLone 1988; Ein-Dor and Segev 1978; Raymond 1985, 1990a). This implies that the research findings based on MIS environments in large firms cannot necessarily be generalized to small firms (DeLone 1981, 1988; Ein-Dor and Segev 1978; Lai 1994; Raymond 1985, 1990b). Since small firms have distinctive and unique computing needs, as well as different technology acceptance patterns compared with large ones (Cragg and King 1993; Massey 1986; Rogers 1995), there is a need to investigate the applicability of these models to small firms.

Recognizing that small firms represent a distinct group, this study extends existing IS implementation as well as small firm research. Relatively little is known about personal computing in small firms (Raymond 1990b). Clearly, many factors influence personal computing acceptance (Adams et al. 1992; Davis et al. 1989; DeLone and McLean 1992; Igbaria et al. 1995; Mathieson 1991; Moore and Benbasat 1991; Straub et al. 1995; Szajna 1996; Taylor and Todd 1995; Thompson et al. 1991). The majority of these studies have investigated the acceptance of technology in large organizations. The present study sought to extend previous research by investigating in a single study the factors affecting personal computing acceptance among users in small firms. Specifically, the objectives of the study were (1) to develop a model of the determinants of personal computing acceptance and (2) to examine both the direct and indirect effects of these determinants of acceptance. The key factors selected for investigation are based on either past factor studies of IS success or factors perceived to be important in a small business context. The research described here used a structural equation modeling technique to simultaneously test the measurement and the structural models. The conceptual model guiding this study is described in the next section.

Conceptual Model and Research Hypotheses

Personal computing is one part of the total computing activity of small firms. Good examples include the use of spreadsheet and database software by professionals and managers to prepare plans or analyze debtors, sales, and costs (Raymond and Bergeron 1992). As in large firms, this computing by professionals and managers in small firms is often a matter of personal choice. However, such relatively voluntary use of computers has the potential to play an increasingly important role in small firms in enabling them to compete successfully and provide better service to customers. Hence, the acceptance of personal computing

has been established to be one of the critical success factors in achieving business success (Drucker 1987). It is becoming a fundamental part of the organizational plan and strategy of a small firm (Raymond and Bergeron 1992). Therefore, to better predict or explain personal computing acceptance, we need to understand the factors affecting it. Thus user acceptance was seen as the dependent variable for this study. This differs from prior studies of computing success in small firms where, typically, a version of user satisfaction has been used to measure computing success at the organizational level (DeLone 1988; Montazemi 1988; Raymond 1985; Soh et al. 1992; Yap et al. 1992).

Why are some users able to exhibit greater acceptance of personal computing? The theory of reasoned action (TRA) (Fishbein and Ajzen 1975) and the technology acceptance model (TAM) (Davis et al. 1989) offer promising theoretical bases for examining the factors contributing to personal computing acceptance in small firms.

Briefly, TAM adapted the generic TRA model to the particular domain of user acceptance of computer technology. TAM replaced TRA's attitudinal determinants, derived separately for each behavior, with a set of two variables (i.e., perceived ease of use and perceived usefulness) employed in many computer technology acceptance contexts. Both models were found to predict intentions and usage satisfactorily. However, TAM was found to be a much simpler and easier to use but more powerful model of the determinants of user acceptance of computer technology. In addition, TAM's attitudinal determinants outperformed TRA's much larger set of measures. The theoretical insights of TAM thus provide a strong basis from which to examine factors contributing to personal computing in small firms. Further, TAM has proven to be successful in predicting and explaining usage across a variety of systems. Although providing insights into the user acceptance of computer technology (Davis et al., 1989), the research focused only on the determinants of usage rather than on the external factors affecting those determinants (e.g., perceived usefulness and ease of use). Further, there was no such study done to examine the applicability on small firms. Thus, this study sought to extend previous research by bringing together TAM and other prior research on technology acceptance in small firms and investigating the network of multivariate relationships among the factors affecting it in small firms.

Because personal computing acceptance has received little prior attention, the study adopted a two-phased approach:

Phase 1. Based on a review of the literature, an initial research model was developed and examined using eight case studies.

Phase 2. Based on the results of the eight case studies and another review of the literature, a revised research model was developed and tested based on a survey of 358 users spread across 203 small firms.

Phase 1 is reported in Zinatelli et al. (1996), with the focus on the results from case research. The case data influenced phase 2 of the study, which is the focus of this paper.

The case data showed that many of the factors that influenced personal computing acceptance in small firms were similar to the factors identified in large organizations. However, the cases also identified the significant influence of extraorganizational factors, including lack of external support. Many inhibiting factors emerged from the case study data, including lack of internal and external support. These results highlighted the fact that small firms have special needs due to their unique organizational characteristics. Furthermore, the users in the case studies revealed low levels of computer sophistication, thus indicating a potential area for increased overall computer sophistication in small firms.

Figure 1 presents the model examined here. The model represents an integration of the theoretical perspectives and the case studies discussed above and posits that personal computing acceptance in small firms is a function of perceived ease of use and perceived usefulness. These two factors are hypothesized to have a direct effect on personal com-

puting acceptance in small firms. The model also proposes that these two factors mediate the effects of the intra- and extraorganizational factors on personal computing acceptance. The figure shows that the intra- and extraorganizational factors are expected to influence personal computing acceptance indirectly through their effects on perceived ease of use and perceived usefulness. It should be noted that, following the work of Adams et al. (1992) and Straub et al. (1995), behavioral intentions were excluded from our model. Szajna (1996) also reported that perceived usefulness has a direct effect on personal computing acceptance (i.e., self-report system usage) for the post-implementation version. Further, based on the revised model of TAM reported by Szajna and by Adams et al., attitudes were also excluded from our model. The network of relationships among the variables in the model and the rationale for the proposed linkages are explained in the following section.

Personal computing acceptance

Researchers have identified several indicators of personal computing acceptance. The most generally accepted measures of personal computing acceptance in small firms appear to be user satisfaction (Montazemi 1988; Raymond 1985, 1987, 1990b; Soh et al. 1992; Thong et al. 1993; Yap et al. 1992) and system usage (DeLone 1988; Soh et al. 1992). However, system usage has been the primary indicator of technology acceptance (Adams et al. 1992; Davis et al. 1989; Straub et al. 1995; Szajna 1996; Thompson et al. 1991). Further, "system usage has a notable practical value for managers interested in evaluating the impact of IT" (Straub et al. 1995, p. 1328). Finally, as the focus of the study was on voluntary computer use rather than mandatory use, system usage was used as an indicator of personal computing acceptance. It is important to note that system usage related to personal computing in its entirety rather than to a specific application, thus enhancing user comparability across small firms.

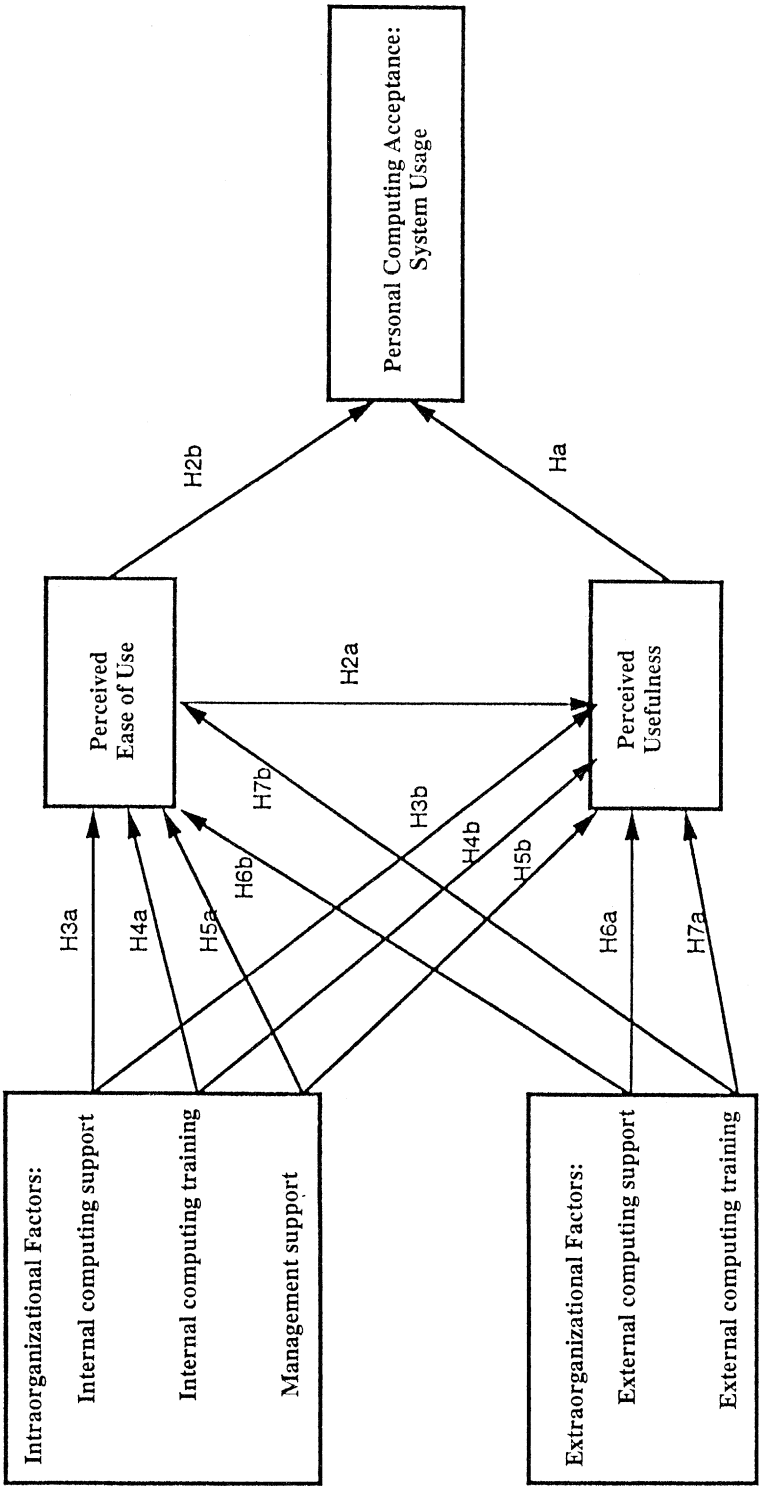
Perceived usefulness

Davis (1989) defines perceived usefulness as "the degree to which a person believes that using a particular system would enhance his or her job performance" (p. 320). The importance of perceived usefulness as an important factor derives from the TRA and TAM models, which propose that perceived usefulness affects computer usage due to the reinforcement value of outcomes. Adams et al., Davis et al., Straub et al., and Szajna reported that user acceptance of computer systems is driven to a large extent by perceived usefulness. Other studies have also reported that perceived usefulness is positively associated with system usage (Igbaria 1994; Thompson et al. 1991). Therefore, the following hypothesis is proposed.

H1. Perceived usefulness has a direct effect on personal computing acceptance.

Perceived ease of use

Perceived ease of use "refers to the degree to which a person believes that using a particular system would be free of effort" (Davis 1989, p. 320). Davis et al. (1989) identified ease of use as an important determinant of system usage through perceived usefulness. Davis suggests that perceived ease of use may actually be a causal antecedent to perceived usefulness. Goodwin (1987) argues that the effective functionality of a system, i.e., perceived usefulness, depends on its usability, i.e., perceived ease of use. Mathieson (1991) and Szajna (1996) each reported that ease of use explains a significant amount of the variance in perceived usefulness. Adams et al. (1992) found that both perceived usefulness and perceived ease of use are important determinants of system usage (mainly in their first study). Similar findings have been reported by Mathieson, Rogers (1995), Straub et al., and Thompson et al. They suggest that, in addition to perceived usefulness, usage is influenced by perceived ease of use. Therefore, the following hypotheses are proposed.



Note: Numbered arrows correspond to the hypotheses described in the text.

Figure 1. Factors Affecting Personal Computing Acceptance in Small Firms

H2a. Perceived ease of use has a direct effect on perceived usefulness.

H2b. Perceived ease of use has a direct effect on personal computing acceptance.

The effect of exogenous variables on personal computing acceptance

Prior research on IS implementation and small firms has found that there are various exogenous controllable factors that influence technology acceptance (Davis et al. 1989; DeLone 1988; Igbaria 1993; Montazemi 1988; Raymond 1988; 1990b; Soh et al. 1992; Thomspon et al. 1991; Thong et al. 1993; Yap et al. 1992). These exogenous factors are expected to influence technology acceptance indirectly through perceived ease of use and perceived usefulness (Davis et al. 1989; Szajna 1996). A better understanding of these exogenous factors may enable practitioners to formulate strategies for improving personal computing acceptance.

The exogenous factors included both intraorganizational and extraorganizational factors. The intraorganizational factors were: (1) internal support, (2) internal training, and (3) management support. Two extraorganizational factors were also included in the model: (1) external support and (2) external training. By including both intra- and extraorganizational factors, the form of the model thus provided an opportunity for further examination of the relative importance to small firm computing of intra- and extraorganizational factors (Thong et al. 1996).

Intraorganizational factors

Internal personal computing support: The importance of internal personal computing support to the success of user computing has been highlighted in many studies (Amoroso 1988; Amoroso and Cheney 1991; Buyukkurt and Vass 1993; Igbaria 1994). Researchers report a positive relationship between personal computing success and various internal user computing support services, mainly through the information center (Bergeron and Berube 1988; Bergeron et al. 1990; Mirani and King 1994; Vijayaraman and Ramakrishna 1990). They reported that systems were more successful when there was user computing support. For most users, system success was higher when more support needs were fulfilled.

Raymond (1990b) states that the level of computing support provided by the IS function was crucial to the acceptance of end-user computing in small firms. However, in small firms, the lack of resources and technical sophistication precludes the creation of an information center or PC support function. Little internal support for personal computing is available to users in small firms (Zinatelli et al. 1996). Informal support, in the form of help from users in other functional areas, manuals, purchased books, and help screens, is often the only form of support available. As a result, some small firms rely on systems analysts/programmers for support for personal computing. For example, both Abdul-Gader (1992) and Montazemi found a positive association between personal computing acceptance and the number of analysts present in small firms. Additionally, high levels of technical support are thought to promote more favorable beliefs about the system among users and IS specialists and greater personal computing success (Igbaria et al. 1995; Lucas 1978). TAM proposes that external factors, such as internal user support, will influence personal computing acceptance by affecting perceived ease of use and perceived usefulness. Therefore, the following hypotheses are proposed.

H3a. Internal personal computing support has a direct effect on perceived ease of use.

H3b. Internal personal computing support has a direct effect on perceived usefulness.

Internal personal computing training: Raymond (1990b) states that personal com-

puting training is an important factor affecting personal computing acceptance in both small and large firms. Prior research also reported that training promotes greater understanding, favorable attitudes, more frequent use, and more diverse use of applications in small firms (Raymond 1988). It was also reported that user training had a significant effect on the decision-making satisfaction of small firm managers who develop their own applications (Raymond and Bergeron 1992). Similarly, training was found to have a positive impact on perceived usefulness (Igbaria et al. 1995; Raymond 1988) and technology acceptance (Amoroso 1988; Amoroso and Cheney 1991; Igbaria et al. 1995; Nelson and Cheney 1987). Based on TAM, it is expected that internal computing training affects personal computing acceptance indirectly through its influence on perceived ease of use and perceived usefulness. Therefore, the following hypotheses are proposed.

H4a. Internal personal computing training has a direct effect on perceived ease of use.

H4b. Internal personal computing training has a direct effect on perceived usefulness.

Management support: Previous studies have identified management support as one of the key recurring factors affecting system success (Cerveny and Sanders 1986; Igbaria 1994; Kwon and Zmud 1987; Lucas 1981). Management support is able to ensure sufficient allocation of resources and act as a change agent to create a more conducive environment for IS success. Therefore, management support is associated with greater system success and lack of it is considered a critical barrier to the effective utilization of information technology. Miller and Toulouse (1986) found that, in small firms, the chief executive officer (CEO) has a greater influence on a company's performance than does the CEO of a larger firm. The CEO of a small firm usually has an "enormous impact—via his power, his face-to-face contacts with virtually all employees, his ownership, and the immediate effects of his expressed goals, perceptions and preferences" (Miller and Toulouse 1986, p. 1393). This may suggest that management support may be much more important in small firms where the owner or CEO is commonly involved in most key decisions and is perhaps the only one who can harness information technology to corporate objectives and strategy. The primary finding of DeLone's (1988) small-firm study was that the successful use of computers was strongly linked to CEO knowledge of computers and active involvement in the computerization efforts. Yap et al. also found a positive correlation between IS success and CEO support. Abdul-Gader concluded that management support had a positive influence on computing acceptance. Additionally, TAM proposes that organizational support, one of the external factors, affects perceived usefulness as well as perceived ease of use. Igbaria et al. (1995) found support for the relationship between management support and perceived usefulness. Therefore, the following hypotheses are proposed.

H5a. Management support has a direct effect on perceived ease of use.

H5b. Management support has a direct effect on perceived usefulness.

Extraorganizational factors

External computing support and training: Raymond (1990b) proposed that the availability and quality of external computing support could be considered as a very important determinant of personal computing success for small firms. Cragg and King found that small firms were very reliant on the advice and support from external sources, including vendors. Such reliance on external help was due to insufficient internal technical expertise. Indeed, previous research has established the positive role that external support can play in helping small firms be more competitive.

Raymond (1990b) states that small firms look to external sources for technical support, such

as small business consulting centers operated by government agencies, universities, or computer vendors. Similarly, small firms could potentially rely on the same external sources for training. Consultants and vendors provide consultancy services specifically to help small firms successfully introduce and implement information systems. They can assist in analyzing requirements, selecting the hardware and software, user training, technical support, and project management.

Gable (1991) and Kole (1983) found that the experience and capabilities of the consultants plays an important role in IS success in small firms. Other studies have found that personal computing success can be achieved through an external computer bureau staffed with IS specialists knowledgeable about small firm needs and constraints (Montazemi 1988). Raymond and Bergeron also proposed that personal computing success could be determined by the support provided by external sources. This was empirically supported by Yap et al., where they found that personal computing success was positively associated with the level of vendor support, including training and technical support, given to small firms. Thong et al. (1993) concluded that the level of IS effectiveness was higher in firms with a high level of vendor support than those with a low level of vendor support. They concluded that small firms with external support, mainly consultants, had higher levels of system success. However, TAM proposes that the external factors, such as the extraorganizational factors, will affect personal computing acceptance indirectly through their effects on perceived ease of use and perceived usefulness. Therefore, the following hypotheses are proposed.

H6a. External computing support has a direct effect on perceived ease of use

H6b. External computing support has a direct effect on perceived usefulness

H7a. External computing training has a direct effect on perceived ease of use

H7b. External computing training has a direct effect on perceived usefulness.

To summarize, our intent is to assess the validity of the research model in a small-firm context in order to develop an appreciation of the relative contributions of the model's constructs. Thus, the analysis and discussion focuses on the overall relationships within the variables (the measurement model) as well as the relationships among the variables (the structural model) and the roles of the mediating variables in influencing personal computing acceptance. The research model is depicted in Figure 1.

Research Methodology

Sample and procedure

Data for this study were collected using a questionnaire survey administered in New Zealand during 1994. As computer usage differs by industry type (Kagan et al. 1990), firms from only two, closely related industry sectors were investigated: manufacturing and engineering. This provided a large sample of small firms in New Zealand (Hamilton and English 1993). In this study, small firms were defined as having between 20 to 100 employees. This definition is based on Bollard's (1984) study and is consistent with many other studies of small firm computing (Soh et al. 1992; Yap et al. 1992). In addition, only independent small firms (i.e., not subsidiary firms) were included in the study. The names and addresses of the small firms were obtained from the *New Zealand Business Who's Who Directory.*

Based on the above criteria, 726 small firms were identified. Initially, the 726 companies received a letter explaining the purpose of the research project and inquiring about the firm's willingness to participate in the study. For each company, a contact person was identified and asked to provide the names and job titles of the company's computer users. Responses from 504 firms were received (69% response rate). The responses included the following: 36

refusal/incomplete, 10 ceased trading/ unreachable, 128 under 20 employees, 22 over 100 employees, 38 subsidiary, and 79 with no computer users. Note that, as two of the criteria for participation in the study were not met by some firms, the total number of non-usable returns (301) is less than the total number of firms discussed above. The total number of small firms that agreed to participate in the study and also fully met the study's criteria was 203, with a median size of 38 employees. Over 50% of the 203 firms had between one and four computer users per firm. In addition, over 30% of the firms had more than five computer users.

Participation in the study was voluntary and people were assured that their individual responses would be treated as confidential. Questionnaires were mailed to the 773 users who had been identified by the contact persons in the 203 firms. A total of 596 users responded, giving an initial response rate of 77%. Many replies contained missing data, so they were excluded. Also, 85 users identified themselves as having clerical/secretarial positions. These 85 were excluded from the final sample as their use of computers was likely to be mandatory rather than voluntary (Hiltz and Johnson 1989) and thus outside the scope of the technology acceptance model. This resulted in a final sample of 358 users, a response rate of 60%. The high response rate was probably helped by the presence of a contact person within each firm.

The majority of the respondents held middle or lower management positions (51.8%); the remaining held non-supervisory positions (33.9%) and top management positions (14.3%). A total of 12% were the top managers in their companies. Users came from a range of functional areas, including: accounting or finance (24%), administrative (12%), manufacturing/production (11%), management (11%), sales (8%), engineering (4%), and marketing (2%).

Of the users, 54.2% were males, and 45.8% were females. Their ages ranged from 19 to 69 with an average of 38.43 years (S.D. = 11.06). Of the participants, 71% did not have a university education; the majority of respondents (37.3%) had obtained a polytechnic qualification, and 32.8% had high school only. The majority of the users were employed in firms with fewer than 50 employees (75.7%). Also, the majority of users were employed in firms that were at least 25 years old.

The sophistication of end users was examined based on the Rockart and Flannery (1983) classification. The majority of users (81%) fell into the nonprogramming and command level categories, indicating a very low level of personal computing sophistication in small firms. Personal computers were used by a majority of respondents; approximately 69% of the respondents indicated that they use a personal computer to do most of their computer work. Respondents had extensive experience with software packages (49%), such as spreadsheets and word processors. Most of the users (over 70%) reported little or no experience with building models and programming with fourth generation languages (4GLs) and/or third generation languages (3GLs). These findings are consistent with the results of previous studies of small firm computing.

Measures

Personal computing acceptance. Based on several studies (Davis et al. 1989; Igbaria et al. 1995; Straub et al. 1995; Szajna 1996; Thompson et al. 1991), system usage was selected as the primary indicator of personal computing acceptance.

System usage. Following the recommendation of Fishbein and Ajzen and to improve reliability, usage was measured by multiple-act indicators (i.e., different acts indicating the same behavior) rather than a single-act indicator. Based on several studies (Cheney and Dickson 1982; DeLone 1988; Igbaria et al. 1989; Soh et al. 1992; Straub et al. 1995), four indicators of system usage were included in this study:

1. The number of different software applications used. Most users in a microcomputer

environment have a wide variety of packages to use. In such an environment, the different software packages can provide a good indication of overall usage and of the variety of tasks performed on the computer. Thus, respondents were asked to indicate which packages they used from a list of eight generic packages (e.g., spreadsheet, data management, word processing, etc.).

2. The number of computer supported business tasks. The computer supported business tasks performed by the user is also an indicator of computer usage. Ten tasks, such as making decisions, looking for trends, planning, and budgeting, were defined and participants were asked to indicate whether they personally used a computer to perform these tasks.

3. The actual amount of time spent on the microcomputer system per day. Based on Lee's (1986) study, individuals were asked to indicate the amount of time spent on the microcomputer per day, using a six point scale ranging from (1) "almost never" to (6) "more than three hours per day."

4. Frequency of use of microcomputers. Frequency of use has been proposed by Raymond (1985) for providing a perspective on use slightly different from actual time spent. Frequency of use was measured on a six point scale ranging from (1) "less than once a month" to (6) "several times a day."

These four indicators are typical of the kind of self-reported measures often used to operationalize system usage, particularly in cases where objective use and acceptance metrics are not available. Self-reported usage should not be regarded as a precise measure of actual usage, although previous research suggests it is appropriate as a relative measure (Blair and Burton 1987).

Perceived usefulness. This measure is defined as "the prospective user's subjective probability that using a specific application system will increase his or her job performance within an organizational context " (Davis 1989, p. 320). The items used to construct the perceived usefulness measure were adapted from Davis et al., with appropriate modifications to make them specifically relevant to personal computing. Individuals were asked to indicate the extent of agreement or disagreement with the four statements concerning computers on a five-point Likert-type scale ranging from (1) strongly disagree to (5) strongly agree.

Perceived ease of use. Based on Davis, perceived ease of use refers to the degree to which computer technology is perceived as relatively easy to understand and use. This measure was adapted from Davis, et al., with appropriate modifications to make it specifically relevant to personal computing. Individuals were asked to indicate the extent of agreement or disagreement with four statements concerning computers on a five-point scale ranging from (1) strongly disagree to (5) strongly agree.

Intraorganizational factors. Three constructs were identified as potential intraorganizational factors affecting user computing success. First, *internal user computing support* is defined as the technical support by individuals (or groups) with computer knowledge who were internal to the small firm. This construct was operationalized using a scale adapted from Amoroso, Igbaria (1993), and Thompson et al. Both Amoroso and Igbaria used instruments that included items on the support provided by information centers. Since small firms would generally not have information centers, the instrument by Thompson et al., which was based on Amoroso's work, was selected as the most appropriate measure in a small firm context. The internal support construct consisted of four items that measured the availability of technical assistance and specialized instruction on a five point Likert scale ranging from (1) "strongly disagree" to (5) "strongly agree" concerning internal support. In particular, respondents were asked to indicate the level of internal support provided to them by computer users or computer specialists in the company.

Second, *internal training* refers to the amount of training provided by other computer users or

computer specialists in the company (Amoroso 1988; Amoroso and Cheney 1991). The case data showed that the most popular software packages among the participants were application packages (e.g., accounting and payroll packages), word processing and spreadsheets. Thus, we focused on four areas: internal training in operating systems, application packages, word processing, and spreadsheet. Participants indicated their internal training level on a five-point scale ranging from (1) "never" to (5) "to a very great extent."

Third, *management support* refers to the perceived level of general support offered by top management in small firms. Individuals were asked to indicate the extent of agreement or disagreement with four statements concerning management encouragement and allocation of resources for personal computing, taken from Igbaria (1990), on a five-point scale ranging from (1) "strongly disagree" to (5) "strongly agree."

Extraorganizational factors. Two constructs were identified as potential extraorganizational factors affecting personal computing acceptance. First, *external computing support* was defined as the technical support by individuals (or groups) with computer knowledge who were external to the small firm. Various measures of external support, including vendor and consultant support, have been used in previous studies (Gable 1991; Thong et al. 1993; Yap et al. 1992). However, these measures focused primarily on project specific support from either vendors or consultants. We wanted, in this study, to capture the amount of external support for personal computing from all possible external sources. Respondents were asked to indicate their agreement or disagreement to the level of external support provided to them by friends, vendors, consultants, or other external sources on a five-point Likert scale ranging from (1) "strongly disagree" to (5) "strongly agree."

External computing training was the second extraorganizational factor. It refers to the amount of training provided by friends, vendors, consultants, or educational institutions external to the company. Similar to the measurement of internal training, the study focused on four areas of training: operating systems, spreadsheet, word processing, and application packages. Participants indicated their external training level on a five-point scale ranging from (1) "never" to (5) "to a very great extent." (See the Appendix for a fuller description of the study variables.)

Data analysis

The research model depicted in Figure 1 was analyzed using Partial Least Squares (PLS), a powerful approach to studying structural models involving multiple constructs with multiple indicators. PLS is a second-generation multivariate technique that facilitates testing of the psychometric properties of the scales used to measure a variable, as well as estimation of the parameters of a structural model, i.e., the strength and direction of the relationships among the model variables. It embodies two sets of equations. The structural equations represent the paths among the constructs/measures. The measurement equations represent the relationships between the indicators/items and the variables that they measure.

PLS allows the researcher to test the relationships within the measures (the measurement model) and the hypothesized relationships between the measures (the structural model) simultaneously (Fornell 1982; Lohmoller 1989; Wold 1982). For each variable included in Figure 1, there is a related measurement model, which links measures to a set of items.

The test of the measurement model includes estimation of the reliability coefficients (composite reliability) of the measures, as well as an examination of the convergent and discriminant validity of the research instruments. In determining the appropriate minimum loadings required for the inclusion of an item within a scale, we used Fornell's recommendation to retain items that loaded highly on their respective measures. A variancee of 0.70 is considered to be a high loading since the item explains almost 50% of the variance in a par-

ticular measure. Fornell and Larcker's (1981) criterion that an average extracted variance should be .50 or more was used to assess the average variance extracted for all measures. We also used the guidelines recommended by Hair et al. (1995) in determining the relative importance and significance of the factor loading of each item, i.e., loadings greater than .30 are considered significant; loadings greater than .40 are considered more important; and loadings .50 or greater are considered to be very significant. Finally, the criteria suggested by Nunnally (1978) were applied to determine the adequacy of the reliability coefficients obtained for each measure.

To assess discriminant validity of the measures, i.e., the degree to which items differentiate among measures or measure distinct concepts, we examined the correlations between the measures of potentially overlapping measures (Grant 1989). If the items associated with a measure correlate more highly with each other than with items associated with other measures in the model (Fornell et al. 1982), the measure is determined to have adequate discriminant validity.

The computer program used for this analysis was LVPLS 1.6 (Latent Variables Path Analysis using Partial Least Squares), developed by Lohmoller (1981, 1989). To test the estimated path coefficients, t-statistics were calculated using a nonparametric test of significance known as jackknifing (Tukey 1958; Wildt et al. 1982).

The test of the structural model included estimating the path coefficients, which are interpreted as standardized beta weights in a regression analysis, and R2, which is used to assess the proportion of variance in the endogenous constructs which can be accounted for by the antecedents. The path coefficient of an exogenous variable represents the direct effect of that variable on the endogenous variable. An indirect effect represents the effect of a particular variable on the second variable through its effects on a third mediating variable. It is the product of the path coefficients along an indirect route from cause to effect via tracing arrows in the headed direction only. When more than one indirect path exists, the total indirect effect is their sum. The sum of the direct and indirect effect reflects the total effect of the variable on the endogenous variable (Alwin and Hauser 1975; Ross 1975).

Results

The measurement model

First, it was necessary to assess the properties of the measurement model. The results of the tests of the measurement model are reported in Table 1. The data show that the measures examined in this study are robust in terms of their internal consistency reliability as indexed by the composite reliability. The composite reliabilities of the different measures included in the model range from .81 to .94, which exceed the recommended values in Nunnally's guidelines. All of the measures possessed adequate reliability and discriminant validity (Tables 1 and 2). The results in Table 2 demonstrate discriminant validity of the measures. The intercorrelations among the items associated with the measures were stronger than their correlations with items representing other measures. Further, consistent with the recommendations of Fornell and Larcker, average variance extracted for all measures exceeded 0.50. An examination of the individual item loadings and reliabilities indicated high loadings for all measures.

Table 2 presents the intercorrelations among the study variables. In all of the 28 entries examined, the squared correlations, representing the shared variance among variables, were found not to exceed the average variance explained. This suggests that our measures are distinct and unidimensional measures. In summary, the convergent and discriminant validity of all measures is satisfactory.

Use of single sources of information could have introduced spurious relationships among the variables. The study variables were collected with the same method: a self-report scale. We tested for the possible effects of common

Table 1. Assessment of the Measurement Model

Variables	The Composite Reliability (Internal Consistency Reliability)	Average Variance Extracted/Explained
Intraorganizational Factors:		
Internal computing support	.92	.74
Internal computing training	.86	.60
Management support	.92	.67
Extraorganizational Factors:		
External computing support	.91	.72
External computing training	.90	.68
Perceived Ease of Use	.94	.81
Perceived Usefulness	.94	.79
Personal Computing Acceptance:		
System usage	.81	.52

Table 2. Intercorrelations Among Study Variables

Variables	1	2	3	4	5	6	7	8
1. Internal Computing Support	.86							
2. Internal Computing Training	.42	.77						
3. Management Support	.30	.13	.82					
4. External Computing Support	.09	.07	.23	.85				
5. External Computing Training	–.06	.11	.02	.28	.82			
6. Perceived Ease of Use	.02	.04	.08	.11	.15	.90		
7. Perceived Usefulness	.12	.14	.30	.20	.12	.47	.89	
8. System Usage	.04	.14	.20	.21	.19	.44	.42	.72

Note: The absolute values of correction >.10 are significant at .05 or lower.
The diagonals represent the square root of the average variance extracted.

method variance for the study variables using Harmon's one factor test (Podsakoff and Organ 1986). (The one-factor test involves subjecting items presumably measuring a variety of different constructs to a single factor analysis. The dominance of one factor would suggest that the items are related because of a common method.) After entering all the items into a factor analysis, eight factors were extracted with eigenvalues greater than one, that together accounted for 70.4% of the variance. The first factor accounted for 20.3% of the variance. Since a single factor did not emerge and one general factor did not account for the majority of the variance in the study, a substantial amount of common method variance was not evident.

Tests of the structural model

The results of the multivariate test of the structural model are presented in Tables 3 and 4. Both tables show the path coefficients, which are the standardized regression coefficients. The tables also show values for R^2, i.e., the amount of variance explained in perceived ease of use, perceived usefulness, and system usage. Table 3 shows that the explained variance in perceived ease of use and perceived usefulness were 4% and 30%, respectively. Table 4 shows that the model as a whole explained 25% of the variance ($p < .001$) in personal computing acceptance, i.e. system usage.

Figure 2 illustrates many of the significant structural relationships among the study variables. Consistent with hypotheses 1 (H1) and 2 (H2b), perceived ease of use and perceived usefulness are both positively related to personal computing acceptance. The data show that perceived usefulness (H1) and perceived ease of use (H2b) have a strong direct effect on usage (β = .29 and .31, respectively, $p < .001$). Perceived ease of use, consistent with H2a, also has a strong direct effect on perceived usefulness (β = .29, $p < .001$). It should be noted that perceived ease of use has a significant indirect effect on system usage through perceived usefulness.

The effects of the extraorganizational factors (external user computing support and external training) and two intraorganizational factors (internal training and management support) on system usage are indirect through perceived ease of use and perceived usefulness.

Inconsistent with hypotheses 3a and 3b, internal user computing support has no significant effects on perceived ease of use and perceived usefulness. However, partial support was found for hypotheses 4a and 4b. While internal training has positive effects on perceived usefulness (H4b) (γ = .08, $p < .05$), it has no significant effects on perceived ease of use (H4a). Additionally, the data confirm the

Table 3. Prediction of Perceived Ease of Use and Perceived Usefulness

Variables	Perceived Ease of Use	Perceived Usefulness		
		Direct	Indirect	Total
Intraorganizational Factors:				
Internal computing support	.01	.01	.00	.01
Internal computing training	.03	.08*	.01	.09*
Management support	.07*	.24*	.03	.27*
Extraorganizational Factors:				
External computing support	.06*	.09*	.03	.12*
External computing training	.14*	.01	.06	.07*
Perceived Ease of Use		.44*		.44*
R^2	.04*			.30*

*p < .05.

Table 4. Prediction of Personal Computing Acceptance: System Usage

Variables	System Usage		
	Direct	Indirect	Total
Intraorganizational Factors:			
Internal computing support		.01	.01
Internal computing training		.04	.04
Management support		.10*	.10*
Extraorganizational Factors:			
External computing support		.05*	.05*
External computing training		.06*	.06*
Perceived Ease of Use	.31*	.13*	.44*
Perceived Usefulness	.29*		.29*
R2	.25*		

* p < .05.

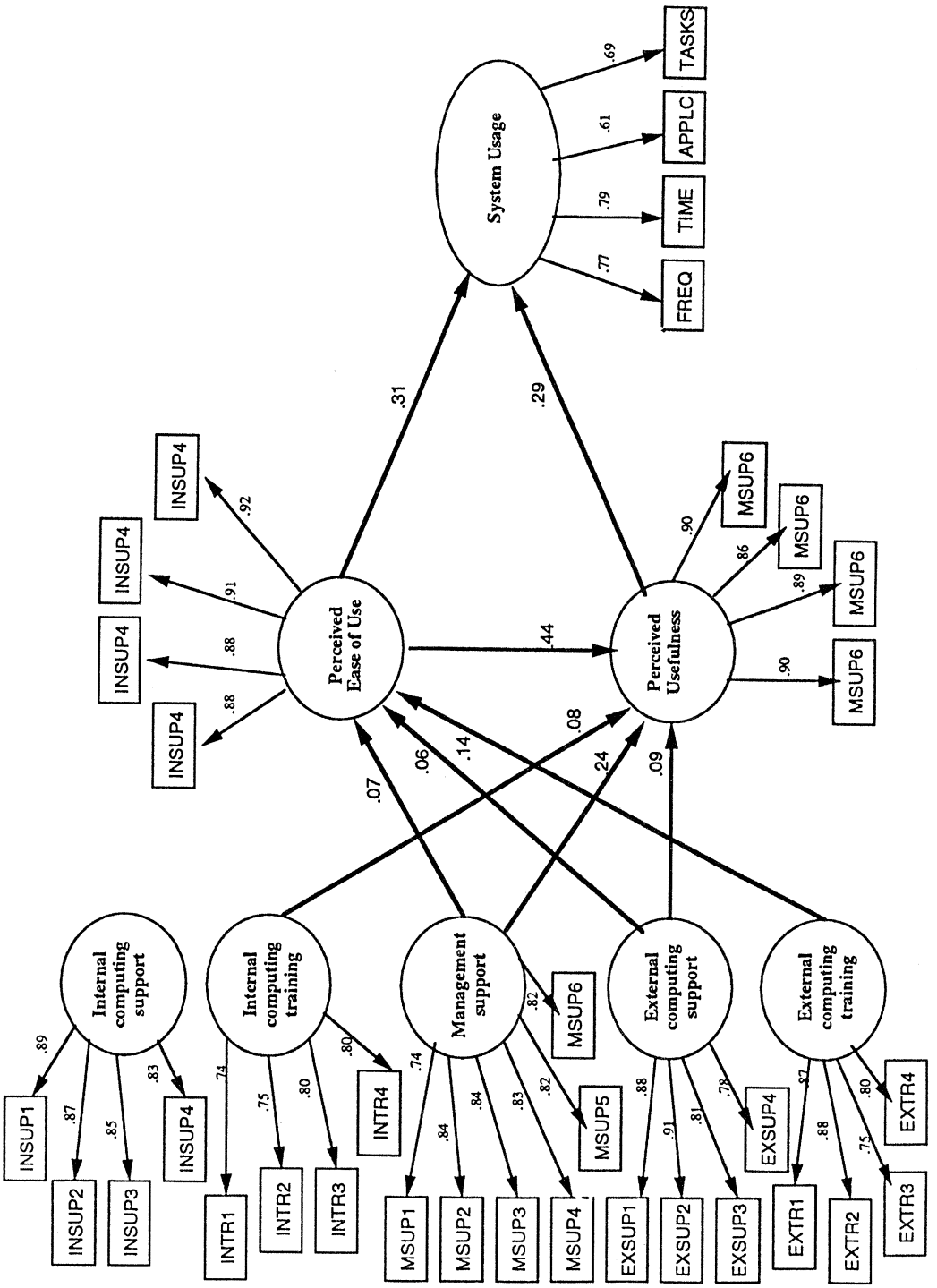


Figure 2. Structural Equation Results—Personal Computing Acceptance Model in Small Firms

importance of management support in influencing perceived ease of use and perceived usefulness directly, and system usage indirectly. Consistent with hypotheses 5a and 5b, management support has positive direct effects on perceived ease of use (H5a) and perceived usefulness (H5b) (γ = .07 and .24, $p < .05$, respectively). Management support also has a significant indirect effect on usage, mainly through perceived usefulness.

The effects of the extraorganizational factors on perceived ease of use and perceived usefulness were also examined. Consistent with hypotheses 6a and 6b, Table 3 shows that external computing support has positive direct effects on perceived ease of use (H6a) and perceived usefulness (H6b) (γ = .06 and .09, $p < .05$, respectively). While external training has no significant effect on perceived usefulness (H7b), it has a positive direct effect on perceived ease of use (γ = .14, $p < .05$). It is also noted that both factors have positive indirect effects on perceived system usage through perceived ease of use and perceived usefulness.

To sum up, the tests of the structural model show that perceived ease of use and usefulness are the dominant factors affecting system usage. Perceived ease of use and management support have the strongest effects on perceived usefulness. The data also show that external computing support and external computing training moderately affect perceived ease of use. The results also demonstrate the importance of perceived ease of use and perceived usefulness in mediating the relationships of the intra- and extraorganizational factors on personal computing acceptance.

Discussion

This study integrated the theoretical perspectives and empirical findings of research on personal computing acceptance in small firms and proposed and tested a structural equation model examining the role of perceived usefulness, perceived ease of use, and the intra- and extraorganizational factors in promoting personal computing acceptance in small firms. TAM was expanded by examining both intra- and extraorganizational variables. It was also extended to a small business context, whereas most previous research has tested it with large firms or college students. The results indicate moderate support for the proposed linkages among the model variables and provide interesting insights into the routes through which the antecedent variables influence personal computing acceptance. The results demonstrate the relative contribution of perceived ease of use and perceived usefulness to variation in personal computing acceptance. The findings reiterate the key mediating role of perceived ease of use and perceived usefulness in promoting personal computing acceptance, i.e., system usage, and demonstrate the utilitarian and rational underpinnings of the decision to use systems in small firms. That is to say, individuals are likely to use the system if they believe that it is easy to use and that using it will increase their performance and productivity.

Inconsistent with prior research (Davis et al. 1989), the total effect of perceived ease of use is greater than the total effect of perceived usefulness on usage. This may suggest that small business users are driven to accept computer technologies primarily on the basis of ease of use and user friendliness and secondarily because of the functions it performs for them. Although users may be willing to cope with some difficulties if the system provides them with important needed information in their job, this result suggests that users who have difficulties using the system may be discouraged from using the system and may not be able to observe the perceived benefits from it. This emphasizes the importance of both perceived ease of use and functionality in developing systems.

A possible explanation is that a user's level of experience with the system may influence the relative importance of perceived ease of use and perceived usefulness. Our survey indicated that the majority of users (over 75%) reported no experience with creating programs using a query language or fourth generation language and/or third generation languages. The effect of ease of use on system

usage is significant early in the use of the system, particularly in a less sophisticated small firm context; its effect becomes non-significant after more prolonged exposure (Adams et al. 1992; Davis et al. 1989). The evolution of information systems from transaction processing to DSS to ES and KBS is progressing at a slower rate in small firms when compared with larger firms (Kagan et al. 1990). A reason for this may be that these systems are as yet too costly and the needed expertise in both applications and internal personnel are not readily available to small firms. Further research needs to examine the differences in the relative importance of perceived ease of use and perceived usefulness at different stages of the growth model (Nolan 1973), i.e., whether perceived ease of use is an important determinant of early adoption but is less important in explaining the level of post-adoption usage. Szajna suggests that a "future research area for the TAM lies in determining the value and status of an experience component" (p. 91). Following the suggestion, these issues require further investigation.

The findings indicate that perceived ease of use is a key intervening variable linking the exogenous variables—intra- and extraorganizational factors—with perceived usefulness and personal computing acceptance. The importance of perceived ease of use is further illustrated by its direct effect on system usage. The positive effect of external training on perceived ease of use suggests that training may enhance a person's self efficacy and serve to demystify personal computing. This suggests that training programs should foster an individual's self confidence and perception concerning the system. Individuals without adequate training are likely to experience problems using the system. Since they are struggling, they may actually believe that the system is too hard to use and that the performance benefits of usage are outweighed by the efforts of using it and eventually become reluctant to use the technology, thus defeating the purpose of introducing the new technology.

Inconsistent with our hypotheses (H3a and H3b) and with most previous IS research in large firms (Abdul-Gader 1992; Amoroso 1988; Buyukkurt and Vass 1993; Igbaria et al. 1995; Rivard and Huff 1988), no relationship was found between internal support and perceived ease of use and perceived usefulness. These results may be a result of the small-firm context under investigation in the present study. For example, DeLone (1988) found that the availability of technical support, mainly for training purposes, did not result in greater IS success in a small firm context. Since very few small firms in this study employ internal computer specialists, it is likely that the quality of the services provided by them may not have been very high. Additionally, since a lack of resources makes it impossible for small firms to establish internal Information centers, Raymond (1990b) proposed that the availability and quality of external support could be considered as a more relevant determinant of personal computing acceptance in small firms.

Internal training, which refers to the amount of training users had received from other users or computer specialists within the firm, had a direct effect on perceived usefulness, consistent with hypothesis (H4b). However, the effect of internal training on ease of use was not supported (H4a). It should be noted that many users reported receiving no internal training (57%). Furthermore, internal training was highly correlated with internal support, which may partially explain the insignificant effect of internal support. It seems possible that, in the absence of internal training, users strive to make use of systems based on their perceived usefulness, regardless of their ease of use. However, it was found that a lack of training caused user frustration (Zintanelli et al. 1996). This suggests that future research should focus on the effects of internal training and support in small firms. The significant effect of internal training on perceived usefulness emphasizes the need for small firms to provide training for users to encourage them to use a greater diversity of software for a wider variety of tasks.

The importance of management support in promoting greater personal computing acceptance has been well-recognized (Guimaraes and Ramanujam 1986; Leitheiser and Wetherbe 1986). Consistent with our hypothe-

ses (H5a and H5b), management support positively affected perceived ease of use and perceived usefulness. Management support can take a variety of forms such as encouragement to use the system, providing a wider selection of user-friendly software of special use to different jobs, offering educational programs, applying information technology to support a wider variety of business tasks, and encouraging experimentation with microcomputers. Features that enhance the potential for higher perceived usefulness could be instrumental in stimulating more extensive usage.

Consistent with our hypotheses (H6a and H6b), external support has a direct positive effect on perceived ease of use and perceived usefulness. This is also consistent with Raymond's (1990b) proposition that the availability of external support is an important determinant of personal computing acceptance in small firms. This suggests that external support combined with management support are important factors that can contribute to effective personal computing implementation in small firms. Adequate and high quality external support can help users understand and use information systems effectively. Additionally, good relationships between users and external support providers, such as vendors or consultants, can help users develop positive feelings and more realistic expectations from the IS implementation, resulting in increased system usage. In essence, with good external support in the form of technical support, training, and a harmonious working relationship, the risk of user computing failure is lowered. Further, due to insufficient internal technical expertise, small firms are expected to engage some form of external computing expertise. Our findings show that the external support has a much stronger influence on personal computing acceptance than internal support. This is consistent with the findings of Cragg and King: with little internal computing expertise and support, small firms are very reliant on their external support.

Consistent with our hypothesis H7a, external training has a positive effect on perceived ease of use. However, its effect on perceived usefulness is only indirect through perceived ease of use. This suggests that external educational and training programs designed to increase individuals' knowledge about computers and their operations may be beneficial in enhancing computer skills and reducing attitudinal barriers to the acceptance of computer technology. Changes in the mode of delivery of instruction and training may be useful in developing individuals' skills in using microcomputers, which in turn will enhance usage through its effects on perceived ease of use. In this study, external training measured the amount of training individuals had received from external sources, which included other computer users, friends, vendors, consultants, or educational institutions external to the company. This finding supports the notion that small firms could potentially rely on external sources of support for training. Similarly, Montazemi identified a growing need for educational institutions to offer in-depth IS programs specifically designed for small firms.

The results are not totally consistent with the findings of Thong et al. (1996), who compared the effects of management support and external IS expertise on IS effectiveness in small firms. They concluded that both variables were important, with external IS expertise as most critical. Our results confirm that both variables are important, but that management support had the greatest influence. These differing conclusions could be due to the use of different dependent variables; our study focused on personal computing acceptance, while Thong et al. studied user satisfaction, organizational impact, and IS effectiveness.

Although this study provides interesting insights into the factors affecting personal computing acceptance in small firms, the results must be interpreted cautiously. First, the model variables explained 25% of the variance in system usage. The fact that 75% of the variance is unexplained suggests the need for additional research incorporating potential variables that were not measured in the current study. Important among these are user participation and involvement, organizational characteristics, and task characteristics (DeLone 1988; Raymond 1990b; Raymond and Bergeron 1992; Zinatelli et al. 1996).

Second, although the structural model results generally support many of our hypotheses, the use of self-report scales to measure the study variables suggests the possibility that common method variance may account for some of the results obtained. Some caution is warranted in interpreting the results because all measures were obtained from users in small firms using a single questionnaire. The authors believe that the results of validity and reliability tests carried out and discussed earlier argue for sufficient confidence in the study measures, but that a similar study with multimethod, multitrait measurements should yield more powerful results. Third, while the findings of this study apply only to small firms in the manufacturing and engineering sectors, the generalizability of these results to other sectors remains to be determined. Additionally, cross-sectional studies such as the present one are useful in identifying the patterns of relationships among the relevant variables, but longitudinal research design is essential to confirm the causal linkages among the study variables. The strengths of the findings would also be enhanced by the use of both subjective as well as objective measures of personal computing acceptance. Finally, further research should also examine the impact of personal computing acceptance on the performance of small firms, as proposed by DeLone and McLean.

Implications for Research and Practice

The final model has a number of implications for research and practice. The results confirmed that perceived usefulness has a strong direct effect on use. This suggests that the functionality of a system must be emphasized to potential users. Researchers can help determine ways to do this effectively, and the model indicates that efforts should focus initially on greater internal training, management support, and external support. Education and training programs should aim to increase awareness of potential applications and emphasize the benefits of using computers. Also, software developers must address usefulness, not only ease of use, as an important design objective when developing systems.

Ease of use also had a direct effect on use, as well as an indirect effect via perceived usefulness. This suggests that efforts to improve perceived ease of use could have a strong influence on personal computing in small firms. For example, computer training could be used to influence perceived ease of use by improving the self-efficacy (Bandura 1982) of computer users.

Internal training rather than internal support had a positive influence on use. This highlights the need for small firms to provide training for users to encourage them to use a greater diversity of software for a wider variety of tasks. Another internal factor of even greater importance was management support. Researchers could seek ways to strengthen management support for personal computing in small firms. This may indicate that vendors, consultants, and educational institutions should provide formal computer education and training programs specifically designed for small-firm managers.

External support had a strong influence on use. Furthermore, external support had a much greater effect on use than internal support. To a lesser extent, external training had a stronger effect on use than internal training. These results highlight a strong need for consultants and vendors to assist small firms in their computing efforts. However, small firms are reluctant to hire consultants because of the costs and associated risks (Zinatelli et al. 1996). Also, vendors and consultants are often reluctant to provide services to small firms because of the low potential for profit. Thus, strategies are required to make external support more profitable for vendors and consultants and at the same time more affordable for small firms.

A possible strategy could involve small firms employing vendors or consultants as a part-time external IS manager. The external IS manager could provide IS support on a regular, possibly monthly, basis for each firm. In addition, support and training sessions could

be made available to firms through an external information center that could be utilized and funded by many small firms. Alternatively, this external information center could be operated by a government agency (for example, a small business development center) or an educational institution. Researchers could examine the effectiveness of such strategies aimed at providing external support to small firms.

Conclusion

This study presents significant progress toward explaining the factors affecting personal computing acceptance in small firms. It aimed to investigate the effects of intra- and extraorganizational factors on personal computing acceptance and the role of perceived ease of use and perceived usefulness in mediating these relationships. The findings are encouraging and provide theoretical and practical insights into personal computing acceptance in a small firm context. The study found considerable support for TAM in small firms. Perceived ease of use was found to be a more important determinant of personal computing acceptance than perceived usefulness, a result that is not consistent with prior research in large firms. This may be due to the fact that small firms in New Zealand may be in the early stages of technology adoption. The results also confirmed management support and external support as the two most significant exogenous variables. This finding supports the call for more efforts to be directed at combining initiatives by management and external providers to achieve greater personal computing acceptance.

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About the Authors

Magid Igbaria is a professor of information science at the Claremont Graduate University and of computers and information systems at the Faculty of Management, Graduate School of Business, Tel Aviv University. Formerly, he was a visiting professor of decision sciences at the University of Hawaii in Manoa, a professor of MIS at Drexel University, and lectured at the University of Waikato in New Zealand. He holds a B.A. in statistics and an M.A. in information systems and operations research from Hebrew University; he received his Ph.D. in computers and information systems from Tel Aviv University. He has published articles on virtual workplace, computer technology acceptance, IS personnel, management of IS, economics of computers, compumetrical approaches in IS, and international IS in *Applied Statistics, Behaviour & Information Technology, Communications of the ACM, Computers & Operations Research, Decision Sciences, MIS Quarterly,* and numerous other journals. His current research interests focus upon electronic commerce, virtual workplace, telework, computer technology acceptance, information and computer economics management of IS, IS personnel, and international IS. He serves on the editorial boards of several journals and is an associate editor of *ACM Transactions on Information Systems* and *MIS Quarterly.*

Nancy Zinatelli is a principal in Ernst & Young's Western Canada Corporate Consulting Group. She specializes in performance improvement and organizational change management. Nancy has experience in reengineering, facilitation, project management, change management, and organizational restructuring. Nancy is a recognized speaker and has given numerous lectures and training sessions on process improvement and managing change to various industry groups and university executive development programs.

Paul Cragg is a senior lecturer in management information systems in the Faculty of Commerce at the University of Canterbury, New Zealand. He teaches in the B.Com., M.Com., and Ph.D. programs. Previously he was on the staff at the University of Waikato, New Zealand, and before that at Leicester Polytechnic, England. Paul's research centers on small firms, where he has conducted numerous studies, particularly on aspects of computerization. Current studies focus on IT alignment, and adoption and use of the WWW. He has published in many international journals including *MIS Quarterly, European Journal of Information Systems, Information & Management,* and *Journal of Strategic Information Systems.*

Angele L. M. Cavaye is senior lecturer at the University of Southern Queensland, Australia. She completed her Ph.D. at the University of Waikato, New Zealand, and has worked at Copenhagen Business School and Delft University of Technology. Her research interests include strategic use of IS, interorganizational systems, IS implementation, and IS in small organizations.

Appendix

Survey

Usage

1. On average, how frequently do you use a computer for job-related work? (Please circle ONE number only.)
   (1) Less than once a month
   (2) Once a month
   (3) A few times a month
   (4) A few times a week
   (5) About once a day
   (6) Several times a day

2. On average, how much time do you spend per day using a computer for job-related work? (Please circle ONE number only.)
   (1) Almost never
   (2) Less than 1/2 hour
   (3) From 1/2 hour to 1 hour
   (4) 1-2 hours
   (5) 2-3 hours
   (6) More than 3 hours

3. For the following specific job tasks, please indicate whether you use a computer to perform each task.
   (1) Producing report
   (2) Letters and memos
   (3) Data storage/retrieval
   (4) Making decisions
   (5) Analyzing trends
   (6) Planning/forecasting
   (7) Analyzing problems/alternatives
   (8) Budgeting
   (9) Controlling and guiding activities
   (10) Electronic communications with others

4. Please indicate whether you use any of the following computer software.
   (1) Spreadsheets (e.g., Excel, Lotus 1-2-3)
   (2) Word processing (e.g., Word)
   (3) Database (e.g., dBase)
   (4) Statistical analysis
   (5) Electronic mail
   (6) Programming languages (e.g., COBOL)
   (7) Graphics
   (8) Application packages (e.g., accounting or payroll packages)

Perceived Usefulness

1 = Strongly disagree
2 = Disagree to some extent
3 = Uncertain
4 - Agree to some extent
5 = Strongly agree

1.	Using computers improves my job performance.	1	2	3	4	5
2.	Using computers increases my productivity on the job.	1	2	3	4	5
3.	I find computers useful in my job.	1	2	3	4	5
4.	Using computers enhances my effectiveness on the job.	1	2	3	4	5

Perceived Ease of Use

1 = Strongly disagree 3 = Uncertain 5 = Strongly agree
2 = Disagree to some extent 4 = Agree to some extent

1.	Learning to use computers is easy for me.	1	2	3	4	5
2.	I find it easy to get computers to do what I want them to do.	1	2	3	4	5
3.	It is easy for me to become skillful at using computers.	1	2	3	4	5
4.	I find computers easy to use.	1	2	3	4	5

Intraorganizational Factors

Internal computing support

*This section is used to assess the level of internal computing support (e.g., other computer users or computer specialists **in the company)***

Please circle ONE number for each item:
1 = Strongly disagree 3 = Uncertain 5 = Strongly agree
2 = Disagree to some extent 4 = Agree to some extent

1.	A specific person (or group) is available for assistance with hardware difficulties.	1	2	3	4	5
2.	A specific person (or group) is available for assistance with software difficulties.	1	2	3	4	5
3.	Specialized instruction and education concerning software is available to me.	1	2	3	4	5
4.	Guidance is available to me in the selection of hardware, software, printers, and other equipment.	1	2	3	4	5

Internal training

*To what extent have you had internal training (e.g., training provided by other computer users or computer specialists **in the company).***

Please circle ONE number for each item for internal training:
1 = Never or to a very little extent 3 = To some extent 5 = To a very great extent
2 = To a little extent 4 = To a great extent

1.	Operation systems	1	2	3	4	5
2.	Spreadsheets	1	2	3	4	5
3.	Word processing	1	2	3	4	5
4.	Application packages (e.g., accounting or payroll packages)	1	2	3	4	5

Management support

Please circle ONE number for each item:
1 = Strongly disagree 3 = Uncertain 5 = Strongly agree
2 = Disagree to some extent 4 = Agree to some extent

1.	Management is aware of the benefits that can be achieved with the use of computers.	1	2	3	4	5
2.	Management always supports and encourages the use of computers for job-related work.	1	2	3	4	5

3.	Management provides most of the necessary help and resources to enable people to use computers.	1	2	3	4	5
4.	Management is really keen to see that people are happy with using computers.	1	2	3	4	5
5.	Management provides good access to hardware resources when people need them.	1	2	3	4	5
6.	Management provides good access to various types of software when people need them.	1	2	3	4	5

Extraorganizational Factors

External computing support

*This section is used to assess the level of external computing support (e.g., support provided by friends, vendors, consultants, or other **external sources**)*

Please circle ONE number for each item:

1 = Strongly disagree 3 = Uncertain 5 = Strongly agree
2 = Disagree to some extent 4 = Agree to some extent

1.	A specific person (or group) is available for assistance with hardware difficulties.	1	2	3	4	5
2.	A specific person (or group) is available for assistance with software difficulties.	1	2	3	4	5
3.	Specialized instruction and education concerning software is available to me.	1	2	3	4	5
4.	Guidance is available to me in the selection of hardware, software, printers, and other equipment.	1	2	3	4	5

External training

*To what extent have you had external training (e.g., training provided by other computer users, friends, vendors, consultants, or educational institutions **external to the company**).*

Please circle ONE number for each item for internal training:

1 = Never or to a very little extent 3 = To some extent 5 = To a very great extent
2 = To a little extent 4 = To a great extent

1.	Operation systems	1	2	3	4	5
2.	Spreadsheets	1	2	3	4	5
3.	Word processing	1	2	3	4	5
4.	Application packages (e.g., accounting or payroll packages)	1	2	3	4	5